PATENT ABSTRACTS OF JAPAN

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(54) PICTURE PROCESSOR AND PICTURE PROCESSING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To attain arithmetic processing of a video signal in a real time.
SOLUTION: Infrared rays made incident to a light receiving part 51 are photoelectrically converted synchronously with a reset pulse supplied from a timing generatorand outputted to an amplifying part 52 synchronously with a light receiving part transfer pulse supplied from a timing generator. The signal inputted to the amplifying part 52 is amplified to a level necessary for processing in the post-device synchronously with an amplifying part drive pulse supplied from the timing generatorand outputted to an arithmetic part 53. The signal inputted to the arithmetic part 53 is temporarily stored in a storage part 61and the signal to which a prescribed arithmetic operation designated according to an arithmetic operation selection signal from an arithmetic operation controlling part is performed is outputted as a binary signal from a comparing part 62 to an outputting part 54. The signal inputted to the outputting part 54 is outputted through a common signal line 42 as a pixel signal synchronously with a selection signal from a horizontal scanning circuit.

CLAIMS

[Claim(s)]
[Claim 1]An image processing device which has the optical area which has arranged two or more elements to matrix formcomprising:

A light-receiving means which receives and carries out photoelectric conversion of the light which enters for every element of said optical area.
A calculating means which calculates a signal by which photoelectric conversion was carried out by said light-receiving means for said every element under a predetermined rule.
An output means which outputs the result of an operation of said calculating means for said every element.
A timing adjustment means which adjusts timing to which the result of an operation is outputted from said output means for said two or more elements of every.

[Claim 2]The image processing device according to claim 1wherein said calculating means includes further a memory measure which memorizes two or more signals of said different timing by which photoelectric conversion was carried out one by one.
[Claim 3]The image processing device according to claim 2wherein said calculating means performs a comparison operation combining two or more signals memorized by said memory measure.
[Claim 4]The image processing device according to claim 3wherein said comparison operation includes an operation which calculates the maximum or the minimum of said signal.
[Claim 5]The image processing device according to claim 1wherein said output means outputs said result of an operation for every sequence of each of said elementor line to timing adjusted with said timing adjustment means.
[Claim 6]An image processing method of an image processing device which has the optical area which has arranged two or more elements to matrix form characterized by comprising the following.
A light-receiving step which receives and carries out photoelectric conversion of the light which enters for every element of said optical area.
An arithmetic step which calculates a signal by which photoelectric conversion was carried out by processing of said light-receiving step for said every element under a predetermined rule.
An output step which outputs the result of an operation of processing of said arithmetic step for said every element.
A timing adjustment step which adjusts timing to which the result of an operation is outputted by processing of said output step for said two or more elements of every.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to the image processing device and method which calculate the signal acquired by carrying out photoelectric conversion of the light which receives the light from the photographic subject to picturizeand which received light for every element about an image processing device and a method under a predetermined ruleand could be made to carry out data processing of the picture signal in real time.
[0002]
[Description of the Prior Art]The art of calculating a picture signal is spreading. For example by calculating a picture signalthis art is usedwhen asking for the stereoscopic picture of a photographic subject.
[0003]Although the operation of such a picture signal acquires two or more signals required for an operation when using an image sensor like CCD (ChargeCoupled Device)After picturizing the repetition photographic subject and accumulating them in memory storage like a frame memorythe accumulated signal was read and it performed.
[0004]The "non-scanning image sensor" as shown in JP6-25653B is considered as the method of realizing shape measuring of real timeand a device.
[0005]
[Problem(s) to be Solved by the Invention]Howeverwhen picturizing a repetition photographic subjectsince one image pick-up would take the time of 33.3msec or 16.6msecthe time which this image pick-up takes became a maximumand it had a technical problem that the result of an operation of picture information could not be obtained any more at high speedfor example.
[0006]Since the result of an operation was not obtained if it did not picturize repeatedly in order to calculate picture informationthe technical problem that the result of an operation was not obtained in real time occurred.
[0007]In order to treat independently the output of each pixel located in a line on the image sensor in the case of the non-scanning image sensor currently indicated by JP6-25653BSince the output signal line from each pixel could not be communalized and the memory measure for

each pixel could not be giving in the element furtherthe feature of "the non-scanning-type" that each pixel operates independently was lostand the technical problem that processing in real time could not be performed occurred.
[0008]This invention is made in view of such a situationand it is made to make the picture signal acquired by carrying out photoelectric conversion of the light which receives the light from the photographic subject to picturizeand which received light for every element calculate in real time in accordance with a predetermined rule.
[0009]
[Means for Solving the Problem]written this invention is characterized by it having been alike and comprising the following at claim 1.
A light-receiving means which receives and carries out photoelectric conversion of the light which enters for every element of optical area.
A calculating means which calculates a signal by which photoelectric conversion was carried out by a light-receiving means for every element under a predetermined rule.
An output means which outputs the result of an operation of a calculating means for every element.
A timing adjustment means which adjusts timing to which the result of an operation is outputted from an output means for two or more elements of every.

[0010]A memory measure which memorizes two or more signals of different timing by which photoelectric conversion was carried out one by one can be further provided in said calculating means.
[0011]Said calculating means can be made to perform a comparison operation combining two or more signals memorized by a memory measure.
[0012]An operation which calculates the maximum or the minimum of a signal can be made to be included in said comparison operation.
[0013]The result of an operation can be made to output to said output means for every sequence of each elementor line to timing adjusted with a timing adjustment means.
[0014]written this invention is characterized by it having been alike and comprising the following at claim 6.
A light-receiving step which receives and carries out photoelectric conversion of the light which enters for every element of optical area.
An arithmetic step which calculates a signal by which photoelectric conversion was carried out by processing of a light-receiving step for every element under a predetermined rule.
An output step which outputs the result of an operation of processing of

an arithmetic step for every element.
A timing adjustment step which adjusts timing to which the result of an operation is outputted by processing of an output step for two or more elements of every.

[0015]In an image processing device according to claim 1 and the image processing method according to claim 6photoelectric conversion of the light which entered for every element of optical area is carried outa signal by which photoelectric conversion was carried out for every element calculates under a predetermined ruleand the result of an operation is outputted for every element.
[0016]
[Embodiment of the Invention]Drawing 1 is a block diagram showing the 1 embodiment of the image processing device 1 which applied this invention. The system control part 11 of the image processing device 1 controls operation of the pattern light projection part 12the imager 15the video signal processing section 16the distance sensors 17and the formed data treating part 18.
[0017]Based on the instructions from the system control part 11the pattern light projection part 12 turns the infrared light of a pattern required for distance measurement to the photographic subject 2and irradiates with it. As this pattern lightslit lightgrid lightetc. are used based on the measuring principle of the distance sensors 17.
[0018]The lens 13 condenses the light from a photographic subjectand introduces it into the prism 14. The prism 14 carries out the spectrum of the light which entered from the lens 13 to visible light and infrared light. That issince there is catoptric light from the photographic subject of the infrared light irradiated from the above-mentioned pattern light projection part 12 in the light from a photographic subject besides visible lightthe spectrum of this is carried out to visible light and infrared lightvisible light is emitted to the imager 15 and infrared light is emitted to the distance sensors 17respectively.
[0019]The imager 15 consists of CCD (Charge Coupled Device)CMOS (Complementary MetalOxide Semiconductor)etc.Based on the synchronized signal and control signal from the system control part 11the information on a color is extracted from the visible light which entered from the prism 14and it outputs to the video signal processing section 16 as a video signal.
[0020]After the video signal processing section 16 performs a gain adjustment and color adjustment processing to the video signal inputted

from the imager 15 based on the synchronized signal and control signal from the system control part 11it is changed into an analog signal or a digital signal if neededand is outputted to the computer 19 as a color video image signal.
[0021]The distance sensors 17 receive the infrared light which entered from the prism 14process this infrared light that received light as a binary-ized signal based on the synchronized signal and control signal from the system control part 11and output it to the formed data treating part 18. About the distance sensors 17details are mentioned later.
[0022]Based on the synchronized signal and control signal from the system control part 11the formed data treating part 18It asks for the timing to which the intensity of infrared light serves as a peak from the binary-ized signal inputted from the distance sensors 17the distance to the photographic subject 2 is computed by the principle of triangulation from the intensityand the three-dimensional shape of the photographic subject 2 is calculated. And the formed data treating part 18 is outputted to the computer 19 by making the result of an operation into a formed data signal.
[0023]The color video image signal with which the computer 19 was supplied from the video signal processing section 16Computer graphics processing is performed to the formed data signal supplied from the formed data treating part 18It outputs to the monitor 3 which consists of CRT (Cathode Ray Tube)LCD (Liquid Crystal Display)etc.and outputs to the external storage 4and the data is stored up.
[0024]Nextthe details of the distance sensors 17 are explained with reference to drawing 2 and drawing 3. The distance sensors 17 are divided roughly and have two types. Are a type which the 1st type scans sequentially the pixel 41 located in a line with the horizontal direction of the optical area 31takes out the output signal from each pixel 41and performs processingand the 2nd typeIt is a type which scans sequentially the pixel 41 located in a line with the perpendicular direction of the optical area 31and takes out and processes the output signal from each pixel. Drawing 2 expresses the composition of the distance sensors 17 of the former typeand drawing 3 expresses the composition of the distance sensors 17 of the latter type.
[0025]Firstwith reference to drawing 2the horizontal scanning type type distance sensors 17 are explained.
[0026]The optical area 31 comprises two or more pixels 41 provided with the calculation functionandas for the nxm individual (= the number of horizontal number x perpendicular directions)the pixel 41 is put in order by matrix form. Each pixel 41 calculates the signal according to

the light volume which received light based on the reset pulse and light sensing portion transfer pulse which are outputted from the timing generator 32The result of an operation is horizontally outputted to the output circuit 34 via the common signal lines 42 based on the selection signal supplied from the horizontal scanning circuit 33a. About the pixel 41details are mentioned later.

[0027]The timing generator 32 supplies a control pulse to the horizontal scanning circuit 33a and the output circuit 34 based on the control signal from the system control part 11and generates an amplifier drive pulsea reset pulseand a light sensing portion transfer pulseand supplies them to each pixel 41 of the optical area 31.

[0028]Based on the control pulse supplied from the timing generator 32the horizontal scanning circuit 33a generates a clear pulse and storage parts store transfer pulsea comparing element drive pulseand a selection signaland supplies them to each pixel 41 of the optical area 31.

[0029]Synchronizing with the control pulse from the timing generator 32it receives via the common signal lines 42and the output circuit 34 outputs the output signal from each pixel 41 of the optical area 31 to the formed data treating part 18.

[0030]The operation control part 35 supplies the operation (it specifies) selection signal which chooses data processing to perform to the matrix circuit 72 (drawing 6) of the storage parts store 61 of the operation part 53 of each pixel 41 corresponding to the control signal from the system control part 11. About the matrix circuit 72 of the storage parts store 61 of the operation part 53details are mentioned later.

[0031]In the distance sensors 17 of the vertical-scanning type type shown in drawing 3It replaces with the horizontal scanning circuit 33a of the distance sensors 17 of the horizontal scanning type type shown in drawing 2the vertical scanning circuit 33b is formedand the output of each pixel 41 which this drove is perpendicularly supplied via the common signal lines 42 in the output circuit 34. Other composition is the same as that of the case in drawing 2.

[0032]Nextthe details of the pixel 41 are explained with reference to drawing 4. The n pixels 41a thru/or 41n connected to the common signal lines 42 shown in drawing 2 are shown in drawing 4. although only the composition of the one pixel 41a is shown here -- the other pixels 41b -- or 41 n is constituted similarly. This is the same also about the case of the distance sensors 17 of drawing 3.

[0033]The light sensing portion 51 of the pixel 41a consists of photo

detectorssuch as a photo-diodefor exampleThe infrared light which enters from the prism 14 is receivedphotoelectric conversion of the infrared light which received light is carried out based on the reset pulse supplied from the timing generator 32and the signal is outputted to the amplifier 52 based on the light sensing portion transfer pulse supplied from the timing generator 32.

[0034]The amplifier 52 amplifies the signal inputted from the light sensing portion 51 even on a level required for processing with a latter device synchronizing with the amplifier drive pulse supplied from the timing generator 32and outputs it to the operation part 53.

[0035]The operation part 53 has the storage parts store 61 and the comparing element 62performs the predetermined operation specified by the operation selection signal from the operation control part 35 in the signal inputted from the amplifier 52and outputs it to the outputting part 54 as a binary-ized signal. About the storage parts store 61 and the comparing element 62details are mentioned later.

[0036]The outputting part 54 is outputted to the output circuit 34 synchronizing with the selection signal from the horizontal scanning circuit 33a by making into a pixel signal the signal inputted from the operation part 53 via the common signal lines 42.

[0037]Herethe operation of the binary-ized signal of the operation part 53 is previously explained in explanation of the storage parts store 61 of the operation part 53and the comparing element 62.

[0038]Although the signal corresponding to the received light volume is amplified by the amplifier 52 and inputted into the operation part 53 by the light sensing portion 51sampling signal [of the infrared light intensity] s (k) shall change with the time k of a samplingas shown in drawing 5. Whenever the time k changes at this timethe sampling signal of infrared light intensity is shown as follows.

[0039]s (k-3)s (k-2)s (k-1)s (k)s (k-1)s (k-2)and s (k-3) -- k-1 assumes that the front value is shown in time rather than ....however k.

[0040]At this timethe function g (k) which shows a displacement difference as shown in the following formulas (1) as a function for detecting the time when the intensity of infrared light serves as a peak is considered.

[0041]

$$g(k) = \{s(k)+s(k-1)\} - \{s(k-2)+s(k-3)\} \quad .... \quad (1)$$

If this function g (k) supports differentiating sampling signal s (k) mostlyand sampling signal [of infrared light intensity] s (k) assumes it to take a positive big value so that it is largeAt the time of g(k) >0it will be shown that sampling signal [of infrared light intensity]

s (k) is increasing to change of timeand it will be conversely shown at the time of g(k) <0 that the intensity of sampling signal [of infrared light intensity] s (k) is decreasing to change of time.
[0042]Thereforethis g (k) becomes the time when the sampling signal of infrared light intensity presents a peak in the time k which changed to the negative value from a positive value.
[0043]By thenthe function f (k) shown in the formula (2) of the following which added the bias of the predetermined level to the function g (k) in consideration of the noise of sampling signal [of infrared light intensity] s (k) as shown in drawing 5. It can ask for the time which detected the peak of the sampling signal of infrared light intensity by the same technique as the above.
[0044]
$f(k) = \{s(k)+s(k-1)\}-\{s(k-2)+s(k-3)\}+BIAS$ .... (2)
the timing which the time k of an intersection with the zero level with which f (k) changes corresponding to change of infrared light intensity s (k)and the value of f in drawing 5 (k) changes from a positive value to a negative value as shown in drawing 5 presents a peak in the infrared light intensity s (k) -- ****** -- it becomes things. Although the peak of infrared light intensity s (k) is sampling time (k-2) and has a gap to the time k in drawing 5Since this serves as a fixed gap which becomes settled uniquely by the function f (k)it can ask for the time k which takes the peak value of sampling signal [of exact infrared light intensity] s (k) by imposing fixed offset to the computed time.
[0045]The operation part 53 outputs the binary-ized signal used as 1 to the output circuit 34when the value of above-mentioned function f (k) is positive or zero and it is 0 and negative. The output circuit 34 is outputted to the latter formed data treating part 18 by making this binary-ized signal into an output signal. The latter formed data treating part 18 searches for the peak of infrared light intensity from the time of the sampling used as the peak of the infrared light intensity called for by this binary-ized signaland computes the distance from this infrared light intensity to a photographic subject by the same principle as triangulation.
[0046]Nextwith reference to drawing 6the storage parts store 61 and the comparing element 62 of this operation part 53 are explained.
[0047]The storage cells 71a thru/or 71d of the storage parts store 61 memorize the signal inputted from the amplifier 52 one by one as a sampling signal of infrared light intensity based on the clear pulses CLR1 thru/or CLR4 sent from the horizontal scanning circuit 33a synchronizing with a sampling synchronized signal.

[0048]Namelyfor examplein a certain time kto the storage cell 71a. To s (k) and the storage cell 71bto s (k-1) and the storage cell 71c. Supposing s (k-3) was memorized by s (k-2) and 71d of storage cellsrespectivelyin the next time k+1. Clear pulse CLR4 is sent from the horizontal scanning circuit 33a to 71 d of storage cells which have memorized the oldest signaland s (k-3) which is a front sampling signal is eliminated synchronizing with this. And synchronizing with the light sensing portion transfer pulse sent from the horizontal scanning circuit 33a immediately after thatthe signal from the amplifier 52 is inputted and s (k+1) which is a sampling signal of new infrared light intensity is memorized by 71 d of storage cells. Whenever the time k of a sampling changes belowthe sampling signal of new infrared light intensity is rewritten one by one by the storage cell which has memorized the sampling signal of the oldest infrared light intensity similarlyand is memorized.

[0049]The signal of a sampling of the infrared light intensity memorized by each storage cells 71a thru/or 71d is outputted in parallel with the matrix circuit 72.

[0050]The matrix circuit 72 makes the switch 81a 84a and 81b thru/or 84b81c or 84cand 81d thru/or 84d turn on and off based on the operation selection signal from the operation control part 35. Namelymake into the signals V1 thru/or V4 here the signal outputted from each storage cells 71a thru/or 71dand in a certain time k to the storage cell 71a. When s (k-3) shall be memorized by s (k) and the storage cell 71brespectivelythe function f (k) which should be calculated is expressed with s (k-2) and 71d of storage cells to s (k-1) and the storage cell 71c by them by the following formulas (3).

[0051]

$f(k) =\{s(k)+s(k-1)\}-\{s(k-2) +s(k-3)\}+BIAS$ .... (3)

Namely$f(k) =V1+V2-V3-V4+BIAS$ .... (4)

It becomes.

[0052]And in the next sampling time k+1since oldest sampling signal s (k-3) of the infrared light intensity of the time k-3 memorized by 71 d of storage cells is transposed to s (k+1)it is as follows. [of the formula which should be calculated]

[0053]

$f(k+1) =\{s(k+1) +s(k)\}-\{s(k-1) +s(k-2)\}+BIAS$ .... (5)

Namely$f(k+1) =V4+V1-V2-V3+BIAS$ .... (6)

It becomes.

[0054]And whenever the time of a sampling changesthe following four kinds of operations will be repeated.

[0055]
f(k) =V1+V2-V3-V4+BIAS .... (7)
f(k+1) =V4+V1-V2-V3+BIAS .... (8)
f(k+2) =V3+V4-V1-V2+BIAS .... (9)
f(k+3) =V2+V3-V4-V1+BIAS .... (10)
Thussince there is no necessity of transmitting the signal itself memorized by changing the combination of addition and subtraction one by one for every sampling timeand performing an operation between storage cellsdegradation of the signal produced in the case of transmission etc. can be controlled.
[0056]Herethe compute modes of the above-mentioned formula (7) thru/or a formula (10) are defined as the modes A thru/or Drespectively.
[0057]Hereit returns to explanation of drawing 6. The matrix circuit 72 controls the switch 81a 84a and 81b thru/or 84b81c or 84cand turning on and off of 81d thru/or 84d based on the compute mode of the operation selection signal transmitted from the operation control part 35. For examplewhen the operation selection signal in the mode A is transmitted to the matrix circuit 72 from the operation control part 35 at the time of sampling time kthe matrix circuit 72Carry out the switches 81a thru/or 84a to oneand the signal V2 memorized by the signal V1 memorized by the storage cell 71a and the storage cell 71b is supplied to the plus input of the differential amplifying circuit 93 of the comparing element 62The signal V4 memorized by the signal V3 memorized by the storage cell 71c and 71 d of storage cells is supplied to the negative input of the differential amplifying circuit 93 of the comparing element 62.
[0058]The load 91a of the comparing element 62 is connected to the plus input of the differential amplifying circuit 93the load 91b is connected to the negative input of the differential amplifying circuit 93respectivelyand the current inputted from the storage cells 71a thru/or 71d is transformed into voltage. The variable current source 92 generates bias currentsupplies it to the plus input of the differential amplifying circuit 93and is added to the signal inputted into the plus input of the differential amplifying circuit 93 among the storage cells 71a thru/or 71d as BIAS in a formula (7) thru/or a formula (10). The differential amplifying circuit 93 calculates the difference of a plus input and a negative input.
[0059]For exampleto the matrix circuit 72 of the storage parts store 61 the operation selection signal in the mode A from the operation control part 35When inputtedthe switches 81a thru/or 84a are carried out to oneand the signal V2 memorized by the signal V1 memorized by the storage cell 71a and the storage cell 71b is inputted into the plus input of the

differential amplifying circuit 93 of the comparing element 62. The signal V4 memorized by the signal V3 memorized by the storage cell 71c and 71 d of storage cells is inputted into the negative input of the differential amplifying circuit 93 of the comparing element 62. Thereforethe differential amplifying circuit 93 will perform the operation of a formula (7).
[0060]In the example of this explanationalthough the differential amplifying circuit 93 is used for the comparing element 62a chopper type comparison circuit can also be used.
[0061]Nextoperation of the image processing device 1 is explained with reference to the flow chart of drawing 7.
[0062]In Step S1based on the control signal from the system control part 11pattern light (infrared light) is generated by the pattern light projection part 12and it glares towards the photographic subject 2. And it is condensed with the lens 13 and the infrared light and visible light which were reflected from the photographic subject 2 enter into the prism 14.
[0063]In Step S2the spectrum of the light which entered is carried out to visible light and infrared light by the prism 14the visible light by which the spectrum was carried out enters into the imager 15and infrared light enters into the distance sensors 17respectively.
[0064]In Step S3the imager 15 extracts the information on a color from visible lightand outputs it to the video signal processing section 16. A gain adjustment and color signal processing are performedand the information on a color that it was inputted into the video signal processing section 16 is outputted to the computer 19 as a color video image signal. On the other handthe distance sensors 17 receive infrared light by each of that pixel 41generate the binary-ized signal which can detect the peak of the intensityand output it to the formed data treating part 18. Processing of the pixel 41 of the distance sensors 17 is mentioned later. The formed data treating part 18 asks for the sampling time which serves as a peak of infrared light from the binary-ized signal from the distance sensors 17by the principle of the infrared light intensity corresponding to the sampling time to triangulationcalculates the distance to the photographic subject 2and outputs it to the computer 19 as a formed data signal.
[0065]In step S4after the computer's 19 compounding the color video image signal and formed data signal which were inputted and performing computer graphics processingoutput to the monitor 3or output to the external storage 4it is made to memorizeand processing is ended.
[0066]Nextin the sampling time k-1 in the timing chart of drawing 9 with

reference to the flow chart of drawing 8and the timing chart of drawing 9V1=s (k-4) V2=s (k-1) V3=s (k-2)and V4=s (k-3) explain the operation in the case of memorizing to the storage cells 71a thru/or 71d of the pixel 41 of the distance sensors 17 of drawing 2 as a sampling signal of infrared light intensity.

[0067]In Step S11if the reset pulse transmitted from the timing generator 32 immediately after the sampling time k-1 is inputted into the light sensing portion 51the light sensing portion 51 will reset a light-receiving leveland will newly start light-receiving of infrared light (the inside of drawing 9accumulation phase).

[0068]In Step S12the light sensing portion 51 carries out photoelectric conversion of the infrared light which newly received light synchronizing with the light sensing portion transfer pulse (not shown) from the timing generator 32and outputs it to the amplifier 52.

[0069]In Step S13synchronizing with the amplifier drive pulse (not shown) from the timing generator 32the amplifier 52 amplifies the signal inputted from the light sensing portion 51and outputs it to the operation part 53.

[0070]The operation part 53 synchronizes with clear pulse CLR1 (drawing 9) from the horizontal scanning circuit 33a in Step S14The signal s of the storage cell 71a which is the oldest signal (k-4) is eliminatedand the storage cell 71a is made to memorize the signal from the amplifier 52 synchronizing with storage parts store transfer pulse TX1 (drawing 9) from the continuing horizontal scanning circuit 33a.

[0071]In Step S15the storage cells 71a thru/or 71d output the memorized signals V1 thru/or V4 to the matrix circuit 72.

[0072]In Step S16the matrix circuit 72The one [the switches 81a thru/or 84a] based on the signal in the mode A of the operation selection signal from the operation control part 35The signals V1 and V2 are supplied to the plus input of the differential amplifying circuit 93 of the comparing element 62 among the signals V1 thru/or V4 inputted from the storage cells 71a thru/or 71dand the signals V3 and V4 are supplied to a negative inputrespectively.

[0073]In Step S17the signal which added BIAS supplied from the variable current source 92 to the signals V1 and V2 inputted into the plus input from the matrix circuit 72and the signals V3 and V4 inputted into the negative input are changed into voltage from current with the loads 91a and 91b. The differential amplifying circuit 93 of the comparing element 62 performs the operation of a formula (7) from these signals V1 thru/or V4 and BIAS synchronizing with the comparing element drive pulse (not shown) from the horizontal scanning circuit 33a (the inside of drawing

9operation phase). And the result of an operation is outputted to the outputting part 54. In the example of drawing 91 is outputted and it is shown that the peak of the infrared light intensity which received light was detected.

[0074]In Step S18the outputting part 54 outputs the result of an operation as a pixel signal to the output circuit 34 via the common signal lines 42 synchronizing with the selection signal from the horizontal scanning circuit 33a (it corresponds to the sampling time k+1 of a sampling synchronized signal) (the inside of drawing 9output phase).

[0075]In Step S19synchronizing with the control pulse from the timing generator 32the output circuit 34 outputs a pixel signal to the formed data treating part 18and ends processing.

[0076]This processing is repeated for every sampling timeas shown in drawing 9. Namelyalthough the above-mentioned processing enters from the reset pulse immediately after the sampling time k-1 at the accumulation phase of compute mode A and enters from clear pulse CLR4 at an operation phaseAt this timeit will enter at the accumulation phase of the operation in that following mode Band this is henceforth repeated by the reset pulse of sampling time k.

[0077]Although the light sensing portion 51the amplifier 52the operation part 53and the outputting part 54 were formed in the pixel 41it may be made to put the operation part 53 and the outputting part 54 on the exterior of the pixel 41 in the above explanationas shown in drawing 10. The example of drawing 10 shows the distance sensors 17 which carried out the operation part 53 and the outputting part 54 of each pixel 41 of the distance sensors 17 corresponding to drawing 2 every exception.

[0078]In drawing 10the same numerals are given to the case of drawing 2and the corresponding portionand the explanation is omitted suitably. In the distance sensors 17 of drawing 10the pixel output line 101 and the memory operation area 102 are newly formed. The pixel signal from each pixel 41 in the optical area 31 is outputted to the storage parts store 61 corresponding to each pixel 41 of the memory operation area 102 via the pixel output line 101. Only the light sensing portion 51 and the amplifier 52 of drawing 4 are provided in each pixel 41 corresponding to drawing 10the portion which consists of the operation part 53 and the outputting part 54 after it is provided in the storage parts store 61 corresponding to each pixel 41 of the memory operation area 102and both are connected to the pixel output line 101. Thusby carrying out every exceptionthe pixel 41 can be efficiently arranged to the optical area 31.

[0079]Drawing 11 is a timing chart which shows processing of two or more pixels 41 of the optical area 31 of drawing 10and the memory operation

area 102. Namelyfor exampleby sampling time [of drawing 9] kand k+1 about the pixel i-1 the storage parts store 61 of the operation storage area 102The signal inputted into the storage cell (either 71a thru/or 71d cell the data of old time is remembered to be) from which data was eliminated synchronizing with the clear pulse via the amplifier 52 and the pixel output line 101 synchronizing with the transfer pulse from the light sensing portion 51 is made to memorize. And the light sensing portion 51 corresponding to the storage parts store 61 is reset by the reset pulseand newly starts light-receiving. On the other handthe signal memorized by the storage cells 71a thru/or 71d performs an operation based on the operation selection signal inputted from the operation control part 35and outputs it to the outputting part 54. And the outputting part 54 is outputted to the output circuit 34 via the common signal lines 42 synchronizing with the selection signal from the horizontal scanning circuit 33a. Thenthe following pixel i performs processing shown in drawing 9 by the same sampling time k as the pixel i-1and k+1. In drawing 10although the horizontal scanning type type case corresponding to drawing 2 was explainedthe same may be said of the vertical-scanning type type case of drawing 3.

[0080]In the above explanationalthough it was made to make an image processing device perform three-dimensional image processingthe image processing device can perform with a picture other processings which need data processing by changing arithmetic contents. For exampleit is good also as three-dimensional thermography by making it apply to the thermography etc. which measure temperature distribution with picture informationand combining above-mentioned three-dimensional image processing and thermography.

[0081]As mentioned aboveimage processing in real time becomes possible by giving a calculation function to each pixel 41.

[0082]

[Effect of the Invention]Since the signal by which photoelectric conversion was carried out for every element of optical area was calculated under the predetermined rule according to an image processing device according to claim 1 and the image processing method according to claim 6data processing of the picture information in real time becomes possible.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram showing the composition of the image processing device which applied this invention.
[Drawing 2]It is a block diagram showing the composition of the horizontal scanning type distance sensors of drawing 1.
[Drawing 3]It is a block diagram showing the composition of the vertical-scanning type distance sensors of drawing 1.
[Drawing 4]It is a block diagram showing the detailed composition of the pixel of drawing 2.
[Drawing 5]It is a figure explaining the arithmetic method of the peak of the light received.
[Drawing 6]It is a figure showing the detailed composition of the operation part of drawing 4.
[Drawing 7]It is a flow chart explaining operation of the image processing device of drawing 1.
[Drawing 8]It is a flow chart explaining operation of the pixel of drawing 2.
[Drawing 9]It is a timing chart explaining operation of the pixel of drawing 2.
[Drawing 10]It is a block diagram showing other composition of the distance sensors of drawing 4.
[Drawing 11]It is a timing chart explaining operation of the distance sensors of drawing 10.
[Description of Notations]
1 An image processing device and 2 A photographic subject and 3 A monitor4 An external storage11 system control partsand 12. A pattern light projection part and 13 A lens and 14 Prism15 An imager and 16 A video signal processing section17 Distance sensors and 18 formed-data treating part19 A computer31 optical areaand 32. A timing generator and 33a A horizontal scanning circuit33b A vertical scanning circuit and 34 output circuits35 An operation control part and 4141aor 41n. A pixel42 common signal linesand 51 A light sensing portion52 An amplifier and 53 Operation part and 54 An outputting part61 A storage parts store and 62 A comparing element and 71a thru/or 71d. A storage cell72 matrix circuits81a or 81d and 82a 82d and 83a thru/or 83d84aor 84d [A differential amplifying circuit and 101 / A pixel output line and 102 / Memory operation area] A switchand 91a and 91b Load and 92 A variable current source and 93